DETAILED ACTION

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto (US 5,814,576) in view of Takeshima (US 2004/0171483).

Yamamoto teaches a zirconium oxide composition represented by the general formula $[X]_aZr_bO_c$ where X can be lanthanum (col. 5, lines 48-56).

Yamamoto does not specifically teach a spacing of the crystal lattice due to a substitution.

Takeshima teaches that compounds with zirconia replaced by rare earth elements have higher heat resistance than zirconia, and specifically, since only a portion of the added lanthanum replaces the zirconia lattice only few oxygen defects are created, and therefore total replacement with lanthanum has the potential to exhibit a new catalytic function. Takeshima teaches that lanthanum can replace zirconia to synthesize a lanthana-zirconia compound oxide with high surface area and many oxygen defects. One method used is water-in-oil micro emulsion, and in Example 3, the lanthana-zirconia had "exactly the theoretical plane spacing, indicating that La^{3+} ion had almost completely replaced the ZrO_2 lattice" (pars. 49, 52, 73, and 76).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the micro emulsion technique as taught by Takeshima to prepare the zirconium oxide of Yamamoto such that lanthanum substitutes for zirconium in the zirconia lattice in order to achieve improved heat resistance, high surface area, and a desirable oxygen storage function. By forming the composition such that lanthanum substitutes for zirconium in the zirconia lattice as taught by Takeshima, the spacing of the crystal lattice due to substitution would obviously correspond to a (111) plane spacing value of a theoretical crystal lattice, as claimed.

Regarding claims 2 and 3, Yamamoto teaches the zirconium oxide containing lanthanum in an amount ranging from 1-40 mol % (col. 6, lines 25-28).

Regarding claims 1, 4, and 5, Yamamoto teaches that the zirconium oxide further contains platinum and more preferably further contains at least one element of alkali metals and/or alkaline earth metals including cesium (col. 10, lines 52-65).

Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Suzuki et al (JP 2002-079097) in view of Takeshima.

Suzuki teaches a composition expressed as $(Al_2O_3)_a(CeO_2)_b(ZrO_2)_{1-b}(La_2O_3)_d$ (par. 39, par. 40, lines 1-2).

Suzuki does not specifically teach a spacing of the crystal lattice due to a substitution.

Takeshima teaches that compounds with zirconia replaced by are earth elements have higher heat resistance than zirconia, and specifically, since only a portion of the

added lanthanum replaces the zirconia lattice only few oxygen defects are created, and therefore total replacement with lanthanum has the potential to exhibit a new catalytic function. Takeshima teaches that lanthanum can replace zirconia to synthesize a lanthana-zirconia compound oxide with high surface area and many oxygen defects. One method used is water-in-oil micro emulsion, and in Example 3, the lanthana-zirconia had “exactly the theoretical plane spacing, indicating that La^{3+} ion had almost completely replaced the ZrO_2 lattice" (pars. 49, 52, 73, and 76).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the micro emulsion technique as taught by Takeshima to prepare the zirconium oxide of Suzuki such that lanthanum substitutes for zirconium in the zirconia lattice in order to achieve improved heat resistance, high surface area, and a desirable oxygen storage function. By forming the composition such that lanthanum substitutes for zirconium in the zirconia lattice as taught by Takeshima, the spacing of the crystal lattice due to substitution would obviously correspond to a (111) plane spacing value of a theoretical crystal lattice, as claimed.

Regarding claims 2 and 3, Takeshima teaches $LaZrO_{3.5}$, with 50% La content (par. 76).

Regarding claim 4, Suzuki teaches that cesium be carried on the oxide composite (pars. 41-42).

Regarding claim 5, Suzuki teaches that platinum be carried on the oxide composite (par. 57).

Claims 1-5 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yamamoto (US 5,814,576) or Suzuki et al (JP 2002-079097), each in view of Taniguchi et al (US 2002/0015674).

Yamamoto teaches a zirconium oxide composition represented by the general formula $[X]_aZr_bO_c$ where X can be lanthanum (col. 5, lines 48-56).

Suzuki teaches a composition expressed as $(Al_2O_3)_a(CeO_2)_b(ZrO_2)_{1-b}(La_2O_3)_d$ (par. 39, par. 40, lines 1-2).

Neither Yamamoto nor Suzuki specifically teach a spacing of the crystal lattice due to a substitution.

Taniguchi teaches the abilities to store oxygen and heat resistant properties are enhanced more by doping cerium oxide into zirconium oxide in combination with some other rare earth oxides, particularly lanthanum oxide rather than by forming a solid solution of cerium oxide solely in zirconium oxide. In the conventional oxygen storage materials, however, when cerium oxide or lanthanum oxide are doped in zirconium oxide, the components do not fully dope and thereby give birth to independent cerium oxide and the like, with the result that the produced solid solution assumes a heterogeneous crystal structure. Taniguchi specifically teaches a composite oxide with a homogeneous tetragonal crystal structure of zirconium oxide, produced by doping cerium oxide and lanthanum oxide into zirconium oxide without forming independent cerium oxide or the like. Taniguchi also teaches that the crystal structure of the zirconium oxide containing cerium and lanthanum is a tetragonal structure of zirconium oxide (pars. 8, 9, and 10).

It would have been obvious to one of ordinary skill in the art at the time of the invention to use the methods of producing a homogeneous tetragonal crystal structure of zirconium oxide as taught by Taniguchi to prepare the zirconium oxides of Yamamoto and Suzuki such that lanthanum or lanthanum and cerium substitute (dope) for zirconium in the zirconia lattice so as to maintain the tetragonal structure of zirconia rather than form a heterogeneous crystal structure. By forming the composition such that lanthanum or lanthanum and cerium substitute for zirconium in the zirconia lattice as taught by Takeshima, the spacing of the crystal lattice due to substitution would obviously correspond to a (111) plane spacing value of a theoretical crystal lattice, as claimed.

Regarding claims 2 and 3, Yamamoto teaches the zirconium oxide containing lanthanum in an amount ranging from 1-40 mol % (col. 6, lines 25-28).

Regarding claims 1, 4, and 5, Yamamoto teaches that the zirconium oxide further contains platinum and more preferably further contains at least one element of alkali metals and/or alkaline earth metals including cesium (col. 10, lines 52-65).

Regarding claims 2 and 3, Taniguchi teaches that the weight ratio of lanthanum to zirconium is in the range of 1:1.5 to 1:60, preferable 1:1.5 to 1:40 (par. 20).

Regarding claim 4, Suzuki teaches that cesium be carried on the oxide composite (pars. 41-42).

Regarding claim 5, Suzuki teaches that platinum be carried on the oxide composite (par. 57).

Response to Arguments

Applicant's arguments filed June 9, 2009 have been fully considered but they are not persuasive. Regarding Applicant's claim of foreign priority, as the priority date has not yet been perfected, the rejections with Takeshima still apply.

Regarding the rejections over Taniguchi, Applicant argues that the "conventional co-precipitation method" of Taniguchi cannot possibly give the desired results reflected in the instant claims. While Applicants show in the instant disclosure that results obtained in the claimed invention may be "higher" than those obtained by a “conventional co-precipitation method," this does not mean that all co-precipitation methods inherently yield less than ideal, or theoretical, results, as implied by Applicant. While Taniguchi might use a co-precipitation method, one of the objects of the invention is to produce a composition displaying improved characteristics. So, to merely state that Taniguchi does not meet the instant claim limitations because the composition is produced by "conventional co-precipitation methods" bears little weight, especially in light of the fact that Taniguchi is improving upon "conventional co-precipitation methods." Regardless of the choice method used, Applicant argues that the instant application and claimed invention allows for lanthanum to be substituted with zirconium to a sufficient degree. However, as stated above and in the previous rejection, Taniguchi teaches a composite oxide with a homogenous tetragonal crystal structure of zirconium oxide, produced by doping cerium oxide and lanthanum oxide into zirconium oxide without forming independent cerium oxide or the like. Therefore, Taniguchi teaches a fully doped zirconium oxide, which is considered to be a “sufficient degree.”

Finally, Applicant argues that because Yamamoto, Suzuki, and Taniguchi are silent with regard to the recited spacing of the crystal lattice structure of the claimed invention, such spacing is nonexistent. It is noted that said spacing of the crystal lattice is "due to the substitution with the element." As Taniguchi teaches such substitution and that the elements are fully doped, both Yamamoto and Suzuki, in view of Taniguchi, would appear to produce such results.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to COLIN W. SLIFKA whose telephone number is (571)270-5830. The examiner can normally be reached on Monday-Thursday, 10:00AM-4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Melvin Curtis Mayes can be reached on 571-272-1234. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/COLIN W SLIFKA/
Examiner, Art Unit 1793

October 23, 2009

/Melvin Curtis Mayes/
Supervisory Patent Examiner, Art Unit 1793